RIGID PAVEMENT DESIGN
(INTERIOR FLOOR SLABS)

PROJECT: _____

LOCATION: _____ DATE: _____

Design By: ____ Checked By: ___

SCOPE: Design of concrete floor slabs-on-grade subject to vehicular loads and to high stationary live loads (loads imposed by movable items).

REFERENCE: TM 5-809-12, Concrete Floor Slabs-on-Grade Subjected to Heavy Loads.
TM 5-822-5, Pavement Design for Roads, Streets, Walks, and Open Storage Areas

NOTE: The use of this form does not preclude compliance with all requirements of TM 5-809-12 or TM 5-822-5.

I. NONREINFORCED STRENGTH DESIGN:

1. Traffic Volume(s):

a. Category of Traffic (page 3-1 & paragraph 3-2, Traffic Distribution).

b. Category	Largest Maximum Axle Load (kips)*	Maximum Load Capacity (kips)	Maximum Operations/Day
I	10	2 to 4	
II	15	4 to 6	
III	25	6 to 10	
IV	36	10 to 16	
V	43	16 to 20	
VI	120	20 to 52	

*Subsequent tables and design curves use these values to represent each category.

Note: Data from Facilities Engineer's office and the Using Agency.

2. Design Index:

a. Categories I, II, III: Design index = __ (page 5-1, Table 3, Traffic Categories for Design Index. This table good for all Cat. I and II forklifts, but only up to 5 passes of a Cat III forklift; i.e., 25-kip max axle-load forklift.)

b. Categories III, IV, V, VI:

(1) No design indices: Separate curves for forklift max axle-loads of 25-kips and greater.

(2) Total design traffic: Total anticipated traffic volume is calculated for each max axle load forklift category over an anticipated 25-year life for the pavement.

__-kip max axle load traffic = __/day x _ days/wk x __ wks/yr x 25 yrs
= _____ passes

__-kip max axle load traffic = __/day x _ days/wk x __ wks/yr x 25 yrs
= _____ passes

__-kip max axle load traffic = __/day x _ days/wk x __ wks/yr x 25 yrs
= _____ passes

__-kip max axle load traffic = __/day x _ days/wk x __ wks/yr x 25 yrs
= _____ passes

3. Modulus of Subgrade Reaction (K) = ___ pci (Based on Field Plate Bearing Tests) or (Based on Table 2, TM 5-809-12 & Fig 9-1, TM 5-822-5.) (Equivalent K at top of __-inch base course)

a. If test results are not available, refer to Table 2, Typical Values of Modulus of Subgrade Reaction, page 4-2, for typical values based on Unified Soils Classification System soil classification and on the in-situ moisture content of the soil. This yields a soil K-value = ___ psi.

b. Read para 5-3e, Non-uniformity (Subgrade), page 5-5: and para 5-5a, Subgrade Conditions (Steel Reinforcing), page 5-6..

c. When a base course is used, use Fig. 9-1, TM 5-822-5 (Jun 92) to determine the K-value on top of the base course; as a function of the base course thickness. This yields a K-value = ___ psi on top of the __-inch base course.. It is good practice to run field plate bearing tests to confirm this value.

4. Concrete 28-day Flexural Strength (P) = ___ psi.

Based on compressive strength: P = (7.5 to 10) x SQRT (Compressive Strength)
Ref: p.5, Design & Control of Conc Mixtures, PCA, 13th Edition
Use 7.5 to 8 for gravels and 9 to 10 for crushed stone.
P = _ x SQRT (____ psi) = ___ psi.

5. Nonreinforced Pavement Thickness:

a. Theoretical nonreinforced pavement thickness (h_d) = ___ inches (to nearest 0.1 inch).

(1) Categories I, II, III: Design index curves, Figure 5-1, Design Curves for Concrete Floor Slabs, page 5-2. These curves are good for all Cat. I and II forklifts, but only up to 5 passes of a Cat III forklift; i.e., 25-kip max axle-load forklift.). This yields h_d = ___ inches.

(2) Categories III, IV, V: Design curves by Axle Load & Passes, Figure 5-2, Design Curves for Concrete Floor Slabs for Heavy Forklifts, page 5-3. This yields h_d = ___ inches.

(3) Design is based on greatest thickness required from design curves for design index and for Category III, IV, and V traffic.

b. Nonreinforced pavement thickness = ____ inches.

(NOTE: EIRS 78-04 Revision - Pavement Concrete. Thickness shall be expressed to the nearest whole or half inch. Round up midway values.)

6. Steel Reinforcement for Nonreinforced Concrete Slabs (for odd-shaped slabs, for slabs with mismatched joints, and where non-uniform subgrade support is a concern in frost regions.).

a. No reduction is allowed in pavement thickness for this reinforcement.

b. Minimum 0.06% distributed steel required in both directions (paragraph 5-5, Steel Reinforcement, pages 5-6 & 5-8).

.0006 x ___" x 12"/' = _____ square inch steel per foot of concrete

USE _" x _" - W_ x W_ WWM yields: _____ square inch steel per foot of concrete (closest common stock size)

Maximum Slab Length (Maximum Joint Spacing):

$L=\{0.00047\ h_r\ (f_S S)^2\}^{1/3}$ Ref Eqn 5-2, para 5-7a(3)d, page 5-16, TM 5-809-12
L = ____ ft say ___ft where: hr = ____" (reinf slab thickness)
fs = 56,000 psi (steel yield strength)
S = % reinf steel
= (_____ sq in per ft / ___" x 12"/') 100%
= _____%

II. REINFORCED STRENGTH DESIGN:

1. Purpose: To increase the size of floor slab panels between joints or to decrease slab thickness requirements.

2. Graphic solution (nomogram):

a. Required thickness of nonreinforced floor slab to nearest 0.1 inch = _____ inches (h_d) (from step I5).

b. Desired thickness of reinforced floor slab = _____ inches ((h_r) (6-inch minimum).

c. Nomogram: Page 5-9, Figure 5-4, Design Thickness for Reinforced Floor Slabs.

(1) Percent steel required = ____ (S, %)

(2) Maximum allowable length of reinforced pavement slabs = ___ feet (L) (25 feet minimum, 75 feet maximum).

(S%/100) x h_r" x 12"/' = No. of square inches steel required per foot of concrete
____ x ____" x 12"/' = _____ square inch steel per foot of concrete

USE _" x _" - W__ x W__ WWM yields: _____ square inch steel per foot of concrete (closest common stock size)

Maximum Slab Length (Maximum Joint Spacing):

$L=\{0.00047\ h_r\ (f_S S)^2\}^{1/3}$ Ref Eqn 5-2, para 5-7a(3)d, page 5-16, TM 5-809-12
L = ____ ft say ___ft where: hr = ____" (reinf slab thickness)
fs = 56,000 psi (steel yield strength)
S = % reinf steel
= (_____ sq in per ft / ___" x 12"/') 100%
= _____%

III. FINAL PAVEMENT SECTION:

1. **Interior Concrete Pavement Section**:

____" Concrete (___ psi flexural strength @ 28 days)
with _" **x** _" **- W__ x W__ WWM** placed __" below the concrete surface.
6-mil polyethylene sheeting (Vapor Barrier)
___" RDM (#57) Base Course {AASHTO M43, #57 crushed stone }

Maximum allowable length of reinforced pavement slabs = ___ feet (L) (25 feet minimum, 75 feet maximum).

2. Reinforcing Around Bollards, Columns and Other Projections Through Pavement Surface: To minimize cracking around projections and to hold these cracks together, place the following additional reinforcing at the corners of all projections, with a minimum of four sets of bars around circular projections greater than 6 inches in diameter:

2 No. 4 Reinforcing Bars, each 4 feet long, Spaced 4 inches apart.
Place bars at the mid-point of the slab

3. Dowel Size and Spacing: (Ref Table 5-3, Dowel Size and Spacing, page 5-23)

___-inch Dia. Bar, __ inches long (min)
Spaced __ inches (min) center to center.

IV. MAXIMUM ALLOWABLE STATIONARY LIVE LOAD:

1. Concrete floor slab thickness = ____ inches (from Step III-1a).

2. 28-day Flexural strength of concrete (P) = ___ psi. (from step I-4)

3. Stationary live load = _____ psf (Table 3-1, Maximum Allowable Stationary Live Load, page 3-3).

4. Modulus of Subgrade Reaction (K) = ___ pci. (from step I-3)

5. Constant factor = ___ (Table 3-1, page 3-3).

6. Maximum stationary live load = ___ x _____ = _____ psf
(Step IV3) x (Step IV5)

Note: The potential consolidation of underlying soils shall be evaluated to determine that no detrimental settlements will occur before specifying stationary live loads greater than 500 psf.